OS – 423

V Semester B.C.A. Degree Examination, October/November 2012
(Y2K7 Scheme)
COMPUTER SCIENCE
BCA 505 : Operations Research

Time : 3 Hours Max. Marks : 80

Instructions : *1) Answer **all** Sections.*

*2) **Use** graph sheet **wherever** necessary.*

SECTION – A

Answer **any eight** questions of the following. **(8×3=24)**

1. Solve the following LPP graphically
   Maximize $Z = 3x_1 + 5x_2$
   Subject to constraints
   $x_1 + 2x_2 \leq 2000$, $x_1 + x_2 \leq 1500$, $x_2 \leq 600$
   and $x_1, x_2 \geq 0$.
2. Define slack and surplus variable with an example.
3. Explain in brief 'North-West Corner Rule'.
4. Explain saddle point with an example.
5. Write the steps for backward computation.
6. Define Basic solution and Basic Feasible solution.
7. Write the dual of the following primal problem
   Maximize $Z_x = 5x_1 + 12x_2 + 4x_3$
   Subject to constraints
   $x_1 + 2x_2 + x_3 \leq 5$,
   $2x_1 - x_2 + 3x_3 = 2$
   where $x_1, x_2, x_3 \geq 0$.

P.T.O.

8. Define :
   i) Pessimistic time
   ii) Most likely time
   iii) Optimistic time.

9. Give the mathematical formulation of transportation problem.

10. Describe Hungarian method for Assignment problem.

SECTION – B

Answer **any four full** questions. **(14×4=56)**

11. a) A firm can produce three types of cloth, say : A, B and C. Three kinds of wool are required for it, say : red, green and blue. One unit length of type A cloth needs 2 meters of red wool and 3 meters of blue wool; one unit length of type B cloth needs 3 meters of red wool, 2 meters of green wool, and 2 meters of blue wool; and one unit of C cloth needs 5 meters of green wool and 4 meters of blue wool. The firm has only stock of 8 meters of red wool, 10 meters of green wool, and 15 meters of blue wool. It is assumed that the income obtained from one unit length of type A cloth is Rs. 3, of type B cloth is Rs. 5 and of C cloth is Rs. 4.
   Determine how the firm should use the available material so as to maximize the income from the finished cloth. **8**

   b) Solve the following LPP by simplex method
   Max. $Z = 3x_1 + 2x_2 + 5x_3$
   Subject to constraints
   $$x_1 + 2x_2 + x_3 \leq 430,$$
   $$3x_1 + 2x_3 \leq 460,$$
   $$x_1 + 4x_2 \leq 420$$
   where $x_1, x_2, x_3 \geq 0$. **6**

12. a) Solve the following LPP by using Big-M method.
   Max. $Z = 3x_1 - x_2$
   Subject to constraints
   $$2x_1 + x_2 \geq 2$$
   $$x_1 + 3x_2 \leq 3$$
   $$x_2 \leq 4$$
   where $x_1, x_2 \geq 0$. **8**

b) Give the dual of the following LPP

Min. $Z = 2x_2 + 5x_3$

Subject to constraints

$x_1 + x_2 \geq 2$

$2x_1 + x_2 + 6x_3 \leq 6$

$x_1 - x_2 + 3x_3 = 4$

where $x_1, x_2, x_3 \geq 0$. **6**

13. a) Determine an initial basic feasible solution to the following transportation problem using VAM.

	W_1	W_2	W_3	W_4	**Availability**
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Requirement	5	8	7	14	

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b) Write the steps to find initial basic feasible solution by Matrix-Minima Method or Least Cost Method. **6**

14. a) The XYZ company has 5 jobs to be done and 5 men to do these jobs. The number of hours each men would take to accomplish each job is given by the following :

		Jobs				
		I	**II**	**III**	**IV**	**V**
	A	16	13	17	19	20
	B	14	12	13	16	17
Men	**C**	14	11	12	17	18
	D	5	5	8	8	11
	E	5	3	8	8	10

Work out the optimum assignment and the total minimum time taken. **8**

b) Give the mathematical formulation of an assignment problem. Justify assignment problem can be viewed as a LPP. **6**

15. A project has the following time schedule

Activity	Time in months
(1 – 2)	2
(1 – 3)	2
(1 – 4)	1
(2 – 5)	4
(3 – 6)	8
(3 – 7)	5
(4 – 6)	3
(5 – 8)	1
(6 – 9)	5
(7 – 8)	4
(8 – 9)	3

i) Construct a network diagram and calculate T_E and T_L.
ii) Find critical path and its duration.
iii) Calculate total float and identify critical path. **14**

16. a) Define with example
i) Pure strategy
ii) Mixed strategy
iii) Pay off matrix
iv) Value of the game. **6**

b) The pay off matrix of a game is given. Find the solution of the game to the Player A and B.

Player B

Player A		I	II	III	IV	V
	I	– 2	0	0	5	3
	II	3	2	1	2	2
	III	– 4	– 3	0	– 2	6
	IV	5	3	– 4	2	– 6

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